

Experimental and simulated wheat data from across a temperature gradient along the River Nile in Egypt

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Abstract: The dataset includes data from detailed field experiments across a temperature gradient at four locations along the River Nile. The data covering four contrasting environments from North (low temperature) to South (high temperature), includes Sakha (north delta, Lower Egypt), Menofya (middle delta), Beni Suef (Middle Egypt) and Aswan (Upper Egypt). Measurements included plant density, aboveground biomass, anthesis and maturity dates, grain yield, grains m⁻², kernel weight, N content in grains, daily weather data (solar radiation, maximum and minimum temperature, precipitation, surface wind, relative humidity, dew point and vapor pressure), soil characteristics as well as data on crop management. Wheat was sown under full irrigation and fertilization with two planting dates. Simulations include three DSSAT-Wheat models (CERES, NWHEAT and CROPSIM).

Keywords: wheat, field experiments, multi-models, simulations

1 INTRODUCTION: Detailed field experiments were conducted during three growing seasons (2011–12 to 2013–14) at four locations along the River Nile. The selected locations range from North (moderate temperature) to South (high temperature) and included Sakha (north delta, Lower Egypt), Menofya (middle delta), Beni Suef (Middle Egypt), and Aswan (Upper Egypt). The field experiments were conducted using the most common modern wheat cultivars Sakha93, Misr2, and Misr1 under full irrigation and fertilization. Two planting dates were adhered to: 20 November (recommended) and 30 November (late, to expose wheat to increased seasonal temperatures). Measurements included plant density, aboveground biomass (at anthesis and maturity), date of 50% anthesis, date of physiological maturity, grain yield, grains m⁻², and kernel weight. The Central Laboratory of Agricultural Climate in Egypt ([www. clac.edu.eg](http://www.clac.edu.eg)) collected daily weather data at the four locations of the experiments. These represent all agroclimatic zones in Egypt, with grain yield ranging from 4.2 to 9.0 t/ha. The study has been published by Asseng (Asseng et al., 2018 and Asseng et al., 2019). Additional details on the data obtained through observation and / or simulation are supplied in the supplementary which is provided with Asseng et al. 2018.

2 MODELS CALIBRATION AND EVALUATION: Three wheat crop models comprised in DSSAT v4.7 – i.e. CERES, NWHEAT and CROPSIM - were tested (Jones et al 2003, Hoogenboom et al 2017). This was done with the data pertaining to the four field experiments along the River Nile, for the three seasons from 2011–12 to 2013–14. Phenology parameters were calibrated with observations from the first season and evaluated with observations from the second and third season, i.e. simulated anthesis and maturity dates were compared with the relevant observed dates. Yield parameters were calibrated to reproduce yield and yield components across seasons, sowing dates, and locations, so that the data were consistent with other spring wheat cultivar parameters and consistent across the three models.

	Experiments			
Location	Sakha	Menofya	Beni Suef	Aswan
Latitude	31.0	30.6	29.1	23.9
Longitude	30.9	31.0	31.0	32.9
Environment	Moderate	Moderate	High	Higher
	temperature	temperature	temperature	temperature
Mean growing season temperature (°C)	17.0	18.0	21.0	25.0
Cultivars	Sakha93, Misr2 and Misr1			
Experimental year	2011/2012, 2012/2013 and 2013/2014			
Total irrigation water applied (mm)	385.0	400.2	440.6	475.0

Model inputs (crop management and cultivar information) and data on soil characteristics suitable for simulation setup are provided as part of the dataset. All simulation results are provided in text format (tab delimited). Also, all measurements and settings for modeling as well as the results from the model runs for these field experiments are provided in text format. In addition, experimental data were provided in an excel table with the information mentioned in the submission.

3 DATA ACCESS AND RETRIEVAL: The data is grouped into four main folders. The experimental and measured data for the different locations during three growing seasons is provided in folder named *Experimental_data_4locations_3seasons*. Soil data for the four locations is provided in file named *Soil_data_4locations*. Daily climatic data during three growing seasons (2011/2014) in different locations along the River Nile is provided in file named *Weather_data_four locations_3seasons*. Finally, simulation outputs of three crop models for different locations through three growing seasons were provided in file named *Simulation_outputs_3models*.

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